



## Compaction of amorphous iron–boron powder

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# Compaction of amorphous iron–boron powder (abstract)

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Large scale practical use of bulk amorphous alloys requires the capability of molding the material to a desired design, for instance by compaction of an amorphous powder. This is a difficult task because the sintering temperature is limited by the crystallization temperature of the alloy.<sup>1</sup> Here we report on attempts to compact amorphous iron–boron particles prepared by chemical reduction of Fe(II) ions in aqueous solution by NaBH<sub>4</sub> (Ref. 2). The particles prepared in this way are pyrophoric, but can be passivated. The small particle size (10–100 nm), characteristic of this preparation technique, should facilitate a compaction. The passivation layer, however, impedes a compaction. Isostatic pressing at 540 K at a pressure of 200 MPa clearly illustrated this; pellets pressed from passivated powder were much more brittle than pellets pressed from unpassivated powder. The density of the pellets was very low ( $\approx 25\%$  of the density of bulk FeB). We have designed a die for uniaxial pressing in which the compaction can be performed without exposing the powder to air and have obtained densities larger than 60% of that of bulk FeB. We have reported studies of the dependence of density and structure on compaction pressure and compaction temperature.

<sup>1</sup>Y. Kawamura, M. Tagaki, M. Senoo, and T. Imura, *Mater. Sci. Eng.* **98**, 415 (1988).

<sup>2</sup>S. Linderorth and S. Mørup, *J. Appl. Phys.* **69**, 5256 (1991).